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Learning to listen: institutional change and legitimization in UK radioactive waste policy

Gordon Mackerron^a and Frans Berkhout^b

^a SPRU-Science and Technology Policy Research, University of Sussex, UK; ^b Institute for Environmental Studies (IVM), VU University Amsterdam, The Netherlands

Abstract

Over the course of 50 years, UK radioactive waste policy change has been coupled with institutional change, without much progress towards the ultimate goal of safe, long-term stewardship of wastes. We explain this history as a search for legitimacy against a shifting context of legitimization needs and deficits. Following Habermas, we argue that legitimization is derived from a process of justificatory discourse. In principle, there must be a reasonable exchange of arguments between diverse parties in society, based on common norms, for legitimacy to be achieved. We show that the work of legitimization in UK radioactive waste policy has moved from a focus on factual validity claims towards an increasing emphasis on deliberative processes. This reframing of legitimization needs explains institutional and policy changes in UK radioactive waste policy. The most recent phase of policy and institutional change, which placed public deliberation about long-term management and disposal options centre-stage, represents a new step towards bridging legitimization deficits. Plans to build new nuclear reactors in the UK based on a more closed 'streamlined' decision process risk reversing the legitimacy gains that have been achieved through growing openness on radioactive waste management.

Keywords: radioactive waste policy; legitimization; deliberative appraisal; United Kingdom

Corresponding author: Frans Berkhout (frans.berkhout@ivm.vu.nl)

Introduction

The atomic age began with images of unconfined and apparently limitless power, but ever since the nuclear enterprise has been dominated by the need to demonstrate control; in the safety of nuclear operations; in preventing the proliferation of nuclear weapons; and in the management of radioactive wastes. In each case the means and ends of control has been different. While each of these dimensions of control remains deeply contentious more than 50 years after the start of commercial nuclear power production, the least tractable problem remains the control of radioactive wastes. Nowhere in the world has a satisfactory, definitive solution been found to the ultimate disposal of all radioactive wastes. Nor is there an expectation that such solutions will be achieved in the short-run. Yet with growing expectations of a 'nuclear renaissance' in many countries, including the UK, as a response to high fossil energy prices and the threat of climate change, there is again an urgent need to learn from the mistakes of past policies in seeking to take new steps to secure radioactive wastes in ways that are broadly accepted by democratic societies.

In this paper we argue that the core problem in radioactive waste policy is to generate and maintain broad public legitimacy for technical and institutional arrangements leading to the long-term control of radioactive wastes. All other aspects of policy have become subsidiary to this central task of achieving broad social and political legitimacy for programmes and policies that aim at control (broadly defined) over these wastes. We explain this as a response to the multiple normative choices that are inherent to radioactive policies and demonstrate our argument by using the example of UK radioactive waste policy over the past 50 years. We show that the content and practice of policy has, through a series of major shifts, become increasingly dominated by assessment and decision-making processes that have included a broader range of opinion, and are more open and deliberative in form. Where once emphasis was placed on the generation of factual validity in closed decision-making procedures supported by scientific research and assessment, today emphasis is placed on facilitating open procedures in which justificatory discourses involving a broad range of stakeholders can take place. This change reflects a deeper shift in societal attitudes to expertise and a demand for greater inclusivity and deliberation in policy processes. We believe these shifts have been particularly marked in radioactive waste policy, but have wider relevance.

In the following section we discuss the concept of legitimation and how it applies to the problem of radioactive waste management. Then we discuss how the search for legitimacy is reflected in

institutional changes related to the segregation of industrial operations and oversight functions, the autonomy of oversight and the diversity of opinion that plays a role in reasoned debate about policy. We then review radioactive waste management policy in the UK since 1946 and analyse institutional change from the perspective of legitimation deficits. We develop conclusions about changes in the ways in which legitimation is generated. We also reflect on what this implies for a new policy debate about radioactive wastes in light of a possible new expansion of nuclear power and the risks to legitimation this expansion would imply.

Legitimation: where facts and norms merge

Legitimacy is an opaque and elusive notion with a long history (Steffek 2003). Max Weber argued that legitimacy is the condition that a social order enjoys when it has 'the prestige of being considered binding' (Weber 1978: 31). Once a social order or decision is considered binding, it follows that social actors will consent to it and comply with it, or at least cease to object to and resist it. Under the condition of legitimacy, an institution or decision becomes a 'given', an accepted fact that *ceteris paribus* goes unchallenged. There are different explanations of how such a condition of 'givenness' may emerge. This may be on the basis of a mythical or higher authority, as where religious faith serves as the basis for a choice, or it may be on the basis of philosophical or legal principles, or as an outcome of institutional or social processes. Regardless of the specific explanation chosen, scholars since Weber have agreed that legitimacy is a motivation for social action that needs to be explained by social scientists. Without legitimacy there can be no social action in an open society because it will generally be difficult to coerce citizens to accept a decision or order that is widely held to be illegitimate.

Weber and later Habermas (1984, 1988) insisted on the role of rational discourse in the constitution of legitimacy. Legitimacy in an open and democratic society, they argued, depends on the rational exchange of arguments in which both the normative validity of values (the acceptability of ideas of what ought to be) and factual validity (the defensibility of truth claims) are tested in a fair and transparent way. So, for instance, the legitimacy of radioactive discharges into the sea from a nuclear facility depends not only on the validity of the scientific assessment of the harm to people that might be caused by the radioactivity, but turns also on the ethical question of whether such harms may be imposed at all. Legitimacy is therefore a place in which facts and values merge, and it demands procedures for an open exchange of arguments, in which participants have a particular commitment to the search for agreement based on a shared understanding of normative positions and a reasonable consensus about

the state of knowledge. These conditions are recognised as being *ideal*, with real conditions approximating to them.

If normative and factual validity are always linked in the generation and maintenance of legitimacy, how does this relate to radioactive waste management? In fact, we can see radioactive waste management as a linked chain of policy commitments, with linked problems of normative and factual validity at each step. This ‘issue linkage’ is a feature of many domains of public policy, normally explained by the need for successful coalition formation around public choice decisions. By linking two or more issues – industrial and employment objectives, for instance – it may be easier to broaden political support for a policy. But another explanation for issue linkage is that it is a feature of contested areas of public policy in which there are high legitimisation needs. The argument here is that legitimisation deficits – that is, where legitimacy becomes weakened by the failure to establish sufficiently broad normative and factual validity around a policy position – tend to be *infectious*. A weakness in the legitimacy in one aspect of a policy will lead to vulnerability in the legitimacy of an associated policy, so that there is a chain of legitimisation deficits which need to be resolved. This chain of legitimacy deficits has important implications for the perceived tractability of a policy issue. If one of the consequences of a legitimacy deficit in a peripheral policy domain is that it risks undermining the legitimacy of a core policy domain (for instance, nuclear reprocessing policy), the political response may be to postpone or withdraw from decisions in the peripheral domain.

Taking this approach, we can see that radioactive waste management policies require legitimacy to be secured across at least four domains of policy – each built around specific normative and factual validity claims, and each influencing the legitimacy of the other. These are:

1. *The legitimacy of the generation of radioactive wastes*: Radioactive wastes are an inevitable consequence of operating nuclear facilities. Given the long history of political debate about nuclear power and nuclear weapons, there are a range of principled objections that are made to the generation of all types of radioactive wastes. Even if it is accepted that nuclear power is legitimate and necessary, there may be objections to alternative ways of dealing with spent nuclear fuel and waste products. Specifically, there have long been objections to the policy of reprocessing nuclear fuel because it leads to the generation of far greater quantities and

complexity in waste streams and because it makes plutonium more accessible for non-civil uses (Berkhout and Feiveson 1993).

2. *The legitimacy of storage versus disposal of radioactive wastes:* One of the fundamental choices facing radioactive waste management is about how long to maintain institutional stewardship over the materials. Many radioactive wastes are radiotoxic for periods of hundreds or thousands of years. Radioactive decay leads to the diminution of this radiological hazard. But until there is decay to natural background levels, there is an assumption that control is exercised over the materials. Such control may include active institutional surveillance and control, or it may involve the remote storage of the wastes outside monitoring with the potential of retrievability. This choice between storage (with institutional controls) or disposal (the relinquishment of institutional control) is fundamental to radioactive waste management (Berkhout 1991). Here too there has been a tradition of debates about storage as a policy option (because it assumes continuity of institutional oversight over very long periods of time), as well as objections to disposal as a policy option (because it removes the option that new knowledge and technology can be applied to the management of wastes in future, or because it reduces active oversight over wastes) (Kasperson 1983).
3. *The legitimacy of standards of protection in radioactive waste disposal:* Radiological protection standards have been formalised internationally since the 1960s, with national regulators interpreting the recommendations on principles and practice developed by the International Commission on Radiological Protection (ICRP 2007). These standards are based on a scientific understanding of the risks to humans of all ionising radiations, but they are also based on normative principles, such as 'dose limits', 'justification' and 'optimisation of protection'. The validity of the science underlying recommendations on dose limits, as well as the practical implementation of such standards in specific places, has come under sustained critique. More broadly, there remain factual and normative questions about the application of such standards over the long-term future. For instance, will standards of risk protection remain the same? Or is it acceptable for current beneficiaries of nuclear technologies to leave a legacy of radiological risk to many future generations?
4. *The legitimacy of claims about the safety of radioactive waste management:* Radioactive materials have a finite lifetime because they decay. But many conventional radioactive wastes have very long lifetimes, up to thousands of years. By adopting the principle of containment, the management philosophy is to achieve near total control over these materials, at least to the

extent that they pose minimal risks to people in the future. Demonstrating the future safety of radioactive waste repositories has proven to be extremely problematic (that is, tests of safety will never be carried out over periods resembling the operating life of a nuclear waste repository). This need for factual validation has led to an enormous growth in geophysical and hydrological surveying, modelling and simulation, and it has produced new scientific research on 'natural analogues' (geological sites that resemble sites that may be used for radioactive waste disposal). Nevertheless, there will remain a large measure of 'hypotheticality' (Haefele 1974) in validity claims about the safety of repositories, requiring special legitimization 'work', with factual and normative elements. A crucial issue, for instance, relates to the kinds of actors who will be able to judge the validity of hypothetical safety assessments. Should these be experts alone, or a broader range of societal actors? And if the latter, do they need to be representative, and who would they represent – current or future generations of people?

The problem of legitimization is therefore not a single problem, but rather a chain of legitimization needs, each with factual and normative aspects. And it is this interplay of validity needs and the fragility of both the factual and the normative claims that are made, which make it so very difficult to achieve 'the prestige of appearing binding' around radioactive waste policies.

Institutional change as a response to legitimization deficits

As Weber makes clear, it is actors and institutions (what he calls social orders) that suffer legitimization deficits, and which seek to repair them. With respect to radioactive waste policy, we see institutional change as primarily a response to perceived legitimization deficits and efforts to rebuild the legitimacy of institutions.¹ Only under conditions of legitimacy are institutions able to function and carry out their roles effectively. This interpretation of institutional change is at odds with a 'functional' explanation of change which would hold that institutional design is determined by a primary function of the organisation – in this case the management and disposal of radioactive wastes. The interpretation presented here rests on the assumption that institutional change can be seen as, for a large part, driven by a search for legitimacy.

¹ Throughout this paper we use a narrow definition of institutions as being organisations, rather than the broader definition favoured by the new institutionalism literature in which institutions include rules and procedural norms that transcend specific organisations. We do this because we are interested in analysing institutions/organisations as agents addressing their own (and others') legitimization deficits.

Before seeking to identify the main dimensions of institutional change that might lead to greater legitimacy, we need first to identify the main actors and institutions. The primary institutions we are concerned with are the nuclear industry, regulatory agencies and advisory bodies, and Government (primarily Government departments).² On the one side this comprises the operators of civil and military nuclear installations (reactors, fuel cycle plants, research facilities, radioactive waste facilities) and on the other a range of regulatory and advisory bodies (related, among others, to nuclear and conventional safety, radiological protection, physical protection of nuclear materials and radioactive waste policies). These organisations have been and are in the private sector, the public sector (including within and outside Government), as well as being public-private hybrids. Government has both orchestrated institutional change and played a central role in each of the new configurations: as owner of nuclear facilities; as the nuclear policymaker; as a sponsor of regulatory and advisory bodies; and as active participant in public and political debates about radioactive waste. Civil society organisations, especially environmental NGOs and local community groups, have also played an important role in shaping policy and institutional change since the early 1980s. Indeed the prominence and coherence of public opposition to RWM policy initiatives are a powerful symptom of the legitimisation deficits suffered by nuclear operators and regulators which this paper highlights.

There are two central features of institutional arrangements in the UK over the past 30 years. First, there has been enormous institutional change in both the civil and the non-civil nuclear industry, with perhaps the most important being the various phases of a failed attempt to privatise the civil nuclear industry. This has meant that parts of the nuclear industry (some commercial nuclear reactors) have been taken out of public ownership, run for a period by privately-owned utility companies and then brought back into public ownership as quasi-autonomous businesses. A primary cause of this failure was the unresolved problem of nuclear decommissioning and waste management, and the uncertain but escalating costs associated with managing them (Mackerron 1991). Complementary to these changes in ownership of segments of the industry, there have been a series of changes in the institutional arrangements around nuclear waste management: from being an integral part of a publicly-owned nuclear utility company (CEGB); to being a wholly-owned subsidiary of the publicly-owned nuclear industry, including the CEGB, (Nirex 1); to being a public-private agency run jointly by privatised and publicly-owned nuclear operators (Nirex 2); and most recently to being in a relatively new Government-

² The media, parliament, the legal system, and consumers have all played a much less important and consistent role. Indeed, the absence of checks and balances that their greater involvement may have brought partly explains the failure to generate legitimacy in UK radioactive waste policy (Walker, 1999).

owned body, the Nuclear Decommissioning Authority (NDA). From 2003 onwards, these operational and management roles have been supplemented by CoRWM, an independent but publicly-funded agency with an initial remit to develop a new and explicitly more legitimate policy process up to 2007, now succeeded by a 'Mark 2' CoRWM with a more limited role of mainly scientific scrutiny of the new policies developed by the first incarnation of CoRWM. The primary motivations for these changes were on the one hand a policy by the UK Government to divest itself of all those interests that could be commercialised, and on the other the attempt to segregate fuel cycle and radioactive waste management activities from those privatised interests – and so to protect them from the commercial and political risks associated with them.

Second, these changes in the ownership and management of the nuclear industry have been matched by changes not only in the economic, but also in the safety, radiological and environmental regulation of the industry. There has been a proliferation of regulatory and advisory agencies, with a shifting emphasis on the need to demonstrate their independence not only from the nuclear industry, but also increasingly from Government itself. In this way, regulatory and advisory bodies, though always funded by Government, have sometimes achieved an almost civil society status with primary responsibilities to parliament and the public, rather than to Government. One of the apparent benefits of privatisation was to bring a clear distance between industry and regulators, who acted first from within Government, but later gained a more independent status, as Government as a whole began to suffer legitimation deficits in relation to the nuclear industry. Just as with the ownership of the nuclear industry, the public-private status of regulatory and advisory bodies has changed markedly and included a wide variety of forms. The primary motivation for change was to seek to achieve new forms of autonomy and independence for regulatory and advisory bodies, while seeking to ensure their effective and authoritative functioning.

Given these institutional dynamics, what are the specific aspects of institutional change indicating a response to legitimation deficits? Here we identify three indicators. The first relates to the role of public and private ownership of the nuclear industry and of the specific parts of the industry charged with managing radioactive wastes (including the full range from spent nuclear fuel, to high-, intermediate- and low-level wastes, to decommissioning wastes and to radioactive wastes associated with industrial and medical uses of radioisotopes). We make the assumption that one of the conditions for reasoned argument about factual and normative validity (the basis for legitimacy), whether such argument is public or not, is that it should be between parties with non-overlapping interests. Ideally this would

mean that operators and regulators (or overseers) should be operating in clearly different spheres, whether public, private or some combination of the two. The degree to which industrial, and regulatory and oversight interests are segregated is an important indicator of legitimacy, as is the question of whether such segregation is increased or decreased in the process of institutional change.

A second indicator relates to the need for autonomy for oversight bodies. Even if industrial and oversight interests are segregated, the overseer may not be autonomous, or have insufficient authority to act in ways that are viewed as running counter to the economic interests of industry or the political preferences of Government. The capacity of regulatory and oversight bodies to act autonomously in testing the factual and normative validity of proposals to manage radioactive wastes is therefore another indicator for legitimacy.³ Here too the question of whether institutional change has led to greater exercise of autonomy is relevant.

The third indicator relates to the *quality* of the reasoned argument leading to legitimacy. Here we make the assumption that the greater the variety of opinions that are brought to bear in an argument, the better will be the quality of the argument and the better grounded will be the justification for action that emerges. In principle, the more diverse the membership of regulatory and oversight bodies,⁴ the greater will be the variety of opinions that are heard. A final indicator would therefore be related to the diversity of representation in oversight bodies related to radioactive wastes (and the changes in this diversity with institutional change).

In assessing the institutional changes related to radioactive waste management in the UK as a response to legitimisation deficits, we will therefore apply three indicators: institutional segregation between operators and overseers; the autonomy of regulatory and oversight bodies; and the diversity of oversight bodies.

Establishing an industry (1946 to 1976): segregating oversight from production

As in most other countries with civilian nuclear power, the UK has found it difficult to make any progress in implementing coherent policies for radioactive waste management, especially for wastes of higher activity levels. Policy has been piecemeal, relying on varying notions of scientifically best advice and

³ The question of whether the opinions of regulatory and advisory bodies are always accepted as final remains open.

⁴ Diversity here can relate to many dimensions including expertise, sector, region, gender, race and so on.

heavily conditioned, until very recent years, by a perceived need to protect spent fuel reprocessing (Berkhout 1991).

In the first 30 years of nuclear power development, from 1946 to the 1976, Government was in a constant hurry to develop nuclear technology. At first this was because of military imperatives; by the later 1950s this had given way to a political desire to establish world leadership in civilian nuclear technology (Williams 1980); and by the early 1970s the issue had become the need to escape from dependence on oil, now apparently controlled by the OPEC cartel. In all this time, the strategic issue of the 'back end' of nuclear power – how to manage the processes of decommissioning and waste management as a whole – was given limited attention, even though the political imperative to reprocess spent fuel was substantially complicating the technical challenge. This did not mean a complete absence of activity: sea dumping of solid wastes started in the 1950s and a shallow land burial site was opened at Drigg (near Sellafield) for low level wastes. But decisions on higher activity, heat-generating products of reprocessing were not made, though the AEA conducted major experiments on vitrification in the late 1950s and 1960s (Berkhout 1991).

In this early period the dominant institution was the publicly-owned Atomic Energy Authority (AEA), which controlled research programmes in both military and civilian areas. It was essentially self-regulating. A Radioactive Substances Act in 1963 developed some formal criteria against which to judge radioactive waste management policy but the institutional dominance of the AEA was unchecked and remained outside parliamentary and departmental oversight. In 1965 a Nuclear Installations Act established the Nuclear Installations Inspectorate (NII) as regulator of safety and health issues on all nuclear sites. By 1971, as the UK civilian nuclear programme faltered and the political strength of the AEA began to ebb, the military responsibilities of the AEA were taken from it and given to the Ministry of Defence, while a new publicly-owned company, British Nuclear Fuels (BNFL) was formed to carry out 'commercial' activities formerly run by the AEA - principally fuel reprocessing at Sellafield. Government took limited strategic interest in radioactive waste management, preferring to leave it in the hands of the 'industry' (primarily BNFL, the AEA, but with increasing influence from the state-owned electric utility, the Central Electricity Generating Board or CEGB).

Politicisation (1976 to 1997): redefining the role of the state

The 1970s saw a major change of context and the rapid politicisation of nuclear power issues across the board. First Government and the state utility the CEGB announced ambitious plans to build at least 18 large new reactors as a response to the first oil shock of 1973/74 (Cook and Surrey 1978). This provoked the foundation of a community opposed to nuclear power. By 1976, waste became directly caught up in the new politicised process. First, the Royal Commission on Environmental Pollution published an eloquent and influential report on nuclear power and the environment (RCEP 1976). For the first time, an official body had examined the waste issue thoroughly and with attention to the politics as well as the technical issues. This so-called 'Flowers report' (after the Chair, Sir Brian Flowers, a distinguished member of the nuclear science community) made a large number of recommendations, the most significant being that Government should not embark on a large programme of nuclear power until it had established that there was a safe containment route for higher activity wastes for the indefinite future. One important effect of the Flowers report was that Government for the first time began to assume – in principle at least – strategic responsibility for radioactive waste management, and this responsibility was given to the relatively new Department of the Environment, where it has remained ever since. In addition the Government appointed an independent Radioactive Waste Management Advisory Committee (RWMAC) to advise ministers on radioactive waste policy.⁵

In 1977 a large public inquiry began on the proposals by BNFL to build a large new reprocessing plant at Windscale (as Sellafield was then known), mainly to cater to overseas demand, especially from Japan. By 1978 the reprocessing plant (THORP) was approved despite a large campaign which unsuccessfully tried to block reprocessing plans. The political protection afforded to reprocessing was re-confirmed. The ringing endorsement given to reprocessing by the judge at the Windscale inquiry (Parker 1978) was evidently at odds with much of the substantive evidence heard, so that this exercise in public consultation in fact marks the start of a deep-seated public mistrust of the radioactive waste policy process.

In this period, starting from Flowers, the political link between waste and new nuclear build was forged, and it has remained important – whenever new build is contemplated – up to the present. Government

⁵ RWMAC gave advice to the Environment Minister. Originally its membership of senior academic and industry scientists was via a closed appointments system. In the mid-1990s there was a new process in which membership was made open to a wider range of applicants. This increased the diversity of the committee. With the formation of CoRWM, RWMAC was put into 'abeyance' in and then formally closed down in 2006.

was bound to respond to Flowers and its main public agency, the AEA, began a drilling programme to look for potential sites for high level wastes in the late 1970s. The programme ended abruptly in 1981, following intense local resistance at the chosen sites (Berkhout 1991). This led, also in 1981, to a decision, following advice from RWMAC (1981) to shelve the question of high level waste policy, formally for 50 years, and to concentrate instead on finding new sites for low level and intermediate level wastes. To execute this policy, a new agency, Nirex (an industry-owned body) was created, initially with a remit to search for LLW and ILW sites. The creation of Nirex marked a switch in Government strategy. By giving the executive role for radioactive waste policy back to nuclear industry (state-owned), the Government hoped to be able to partly-segregate the oversight role of the regulator – as predicted in our first indicator above. Nirex pursued several different repository search programmes in the 1980s, all of them abandoned in the face of local opposition, with political decisions frequently taken just ahead of General elections. With each of these decisions, the lack of autonomy of Nirex and the regulator from political control was further demonstrated, and as a result its legitimacy suffered. A more measured programme, started after 1987, led to the development of a proposal to site an ILW repository close to Sellafield. Meanwhile the sea dumping route, previously used for some liquid, solid and plutonium-contaminated materials became unworkable, following pressure from Greenpeace, the London Dumping Convention and finally in 1983 from a boycott from the National Union of Seamen.

Policy up to 1997 was often described as ‘decide, announce, defend’ (DAD), meaning that Government, the nuclear industry and selected scientists would develop policy in a closed environment, then announce it and finally seek to defend it against the tide of opposition that always ensued. Given the UK Government’s unwillingness to force radioactive waste management sites on resistant local populations, this also meant that the word ‘abandon’ had to be added to DAD – DADA was a fair representation of two decades of policy failure. In terms of the second and third indicators outlined earlier, policy and practice throughout the 1983-1997 period also scored poorly. There was no evident sign of autonomy in the activities of Nirex, and there was very little diversity or deliberation: policy was developed by a closed community in Government, and more or less exclusively by a small group of nuclear industry insiders, with a contribution from a limited part of the scientific/academic community, principally earth scientists in RWMAC.

In terms of knowledge claims, DAD represented a position in which the ‘best science’ was privileged in policy formulation. It was taken as given that the process should start with, and be dominated by, the

application of science. Given that the best scientific advice was always to adopt geological disposal, the main scientific and technical task was to find the best disposal site. One of the curious aspects of these science-led searches was that they rested on an implicit assumption of optimality. On the one hand, there existed the conviction that a rational process would deliver a 'best possible' solution (factual validity). On the other hand, the notion that there was a site where the risk was lowest appealed to a normative sense that this would also produce a socially-optimal distribution of risks (normative validity). Intrinsic to this procedure was also the assumption that public consultation in a Public Inquiry would be necessary only after a 'best' site had been chosen. Even then the avowed purpose was not exchange and engagement – it was rather to persuade local and wider communities of the virtues of the scientifically framed initial siting decision.

In 1989, the Government's plan to privatise nuclear power along with the rest of the electricity supply industry, came unstuck (MacKerron 1996). First the Magnox reactors, and then the Advanced Gas-Cooled Reactors (AGR) and the prospective Pressurized Water Reactor (PWR) at Sizewell had to be removed from privatisation and kept in public ownership. The over-riding cause was that nuclear power – previously advertised by the CEGB as having lower costs than fossil-based power - was on the contrary evidently substantially more expensive. The critical problem was the expected costs of decommissioning and waste management; these costs were not only expected to be high, but also subject to deep and un-remediable uncertainty, with major risks of serious future cost escalation. This episode deepened public mistrust of Government and industry information and plans. However it also threw the nuclear industry into long-lasting disarray: a formal moratorium on new build till 1994 was followed by a decade in which nuclear new build seemed completely off the political and business agenda. The apparent implausibility of new nuclear investment helped establish a climate, after 2000, in which policy on radioactive waste could be reasonably focussed only on legacy wastes, without the political 'infection' that the prospect of new build would bring.

Important changes in the safety and environmental regulation of nuclear power occurred in the 1990s. A new Radioactive Substances Act became law in 1993, updating the 1960s legislation. By contrast, a 1995 White Paper on radioactive waste management proposed very little change to the status quo (UK Government 1995). Safety and environmental regulation was split between two agencies (in England and Wales). The Nuclear Installations Inspectorate (now a division of the Health and Safety Executive) continued to have responsibility for the safety licensing of all nuclear sites, including research and waste

installations. Regulation of the environmental impact of nuclear sites was placed in the Environment Agency (a semi-autonomous regulatory agency), from which all nuclear sites had to gain approval for radioactive discharges. This division of responsibility did not always work well, and led to the two regulators signing a memorandum of understanding which more clearly spelled out the division of their responsibilities and provided a better basis for co-ordination between them (HSE 2001)

Central Government also had divided responsibilities for nuclear power, even though the environment ministry, now re-named Defra (Department of Environment, Food and Rural Affairs) remained the constitutional lead for radioactive waste management issues. The Department of Trade and Industry (DTI) had responsibility for 'commercial' aspects of nuclear power, including policy on nuclear electricity generation and for BNFL, which had both clean-up responsibilities, as well as reprocessing and fuel fabrication activities. This division worked reasonably well as long as nuclear new build was off the agenda. However by 2005 new build started to become prominent again and tensions emerged between the two Departments. The reason was that DTI, as sponsors of new build, wanted a rapid 'solution' to the radioactive waste management issue as it perceived failure of action over waste as a probable impediment to the approval of new build. Defra on the other hand, unencumbered by this promotional role, was more interested in making sure that radioactive waste policy was put on a sustainable long-term basis, having presided over policy failure for two decades.

Collapse of the old order (1997 to 2003)

Meanwhile the more measured Nirex process concentrated on two sites for deep ILW disposal, Sellafield⁶ and Dounreay⁷, though most attention was concentrated on Sellafield. Whatever the geological merits of these two sites, it was evident to the public and many stakeholders that the primary reason for this choice was the political acceptability likely to be won in areas that were used to, and heavily dependent on, the nuclear industry. A public inquiry was held in 1995/96 into a Nirex proposal to make Sellafield the national ILW disposal site. Nirex faced formidable opponents in the shape of Cumbria County Council and Friends of the Earth, both of which employed a wide range of credible expertise. Their evidence pointed to a number of problems and inconsistencies in the Nirex proposal, including a critique of the process of site selection and detailed scientific critique of the suitability of the

⁶ Sellafield (previously Windscale) is BNFL's main site in the north-west of England with nuclear reactors, reprocessing plants, research facilities and waste management installations.

⁷ Dounreay is the site of a major UKAEA research facility in the north of Scotland with three reactors and waste management facilities.

site. Government (Styche 1997) endorsed the Inquiry Inspector's verdict in 1997, which was crushing for Nirex: the Inspector turned down the proposal on multiple grounds: process, scientific evidence; and economics. Government, facing an imminent General Election, rapidly endorsed the Inspector's verdict, and radioactive waste disposal policy had reached a complete dead end.

Despite the major reversal Nirex suffered in 1997, it continued to exist and eventually succeeded in becoming wholly-owned by Government, rather than by the nuclear industry, though this was not achieved until 2003. At the technical level, it developed a concept of phased geological disposal where a repository might remain open for up to 300 years, and in process terms it engaged in a new commitment to public and stakeholder involvement. However its credibility had been seriously damaged by the failure of the 1997 Sellafield proposal and it made little impact subsequently.

In 1999 the House of Lords Science and Technology Committee published a major new report into radioactive waste management (House of Lords 1999), recommending the establishment of a new Commission to oversee policy. Perhaps most important, the Committee argued that policy could only be made effectively if public and stakeholders were engaged in the process from the start, and not just in seeking approval after the fact. This was the first time that any part of the policy system had acknowledged the failure of the secretive, expert-dominated process that had prevailed over the previous five decades. In the same year a non-Governmental but well-publicised 'consensus conference' - featuring a citizens' jury - met to deliberate on the right way forward for radioactive waste strategy (UK CEED 1999).

Defra, faced with the policy dead-end of the Nirex failure of 1997, was perhaps influenced by the consensus conference and the House of Lords. It began to think of radically alternative policy-making processes. In this it was influenced by the growing tendency in other areas of policy involving science and technology to engage the unaligned public and relevant stakeholders in policy formation, as well as by the advice of RWMAC. This led, after substantial delay, to a consultation paper in 2001, *Managing Radioactive Waste Safely* (Defra 2001), which offered a fresh approach. It acknowledged the depth of public mistrust in earlier policy processes and proposed the setting up of a new advisory body (the Committee on Radioactive Waste Management, CoRWM) to recommend – starting from a 'blank sheet of paper' - the right way forward for radioactive waste management strategy.

Elsewhere there were important changes in the overall approach to managing the whole of the nuclear ‘back end’ – decommissioning as well as waste management. Influenced by rapidly rising estimates of the costs of decommissioning and waste management and by the post-Thatcher neo-liberal consensus, Government was keen to introduce mechanisms of competition into back end management. This led to a White Paper in 2002, from the DTI *Managing the Nuclear Legacy* (DTI 2002). The main overt purposes in this White Paper were to harmonise and rationalise back-end policy by creating a new public body, eventually called the Nuclear Decommissioning Authority (NDA), to manage all public sector nuclear liabilities (military, civil and research), and to introduce a new system of long-term planning and international competitive bidding for decommissioning work. A less overt – but strongly pursued – objective was the breaking up (and substantial sale) of BNFL, which was now perceived by Government as an obstacle to efficient management of back end activities.

Reconstructing legitimacy through deliberative appraisal (2003 to 2008)

Ever since the ‘decision’ in 1982 to postpone consideration of the management of HLW for 50 years, official policy up to 1997 had been to concentrate only on ILW. When Government decided to set up the Committee on Radioactive Waste Management (CoRWM) in 2003 to consider long-term waste strategy, it put HLW back on the agenda. Not only did Government include HLW on the agenda for CoRWM, it also added spent fuel, uranium and plutonium, on the grounds that any or all of these might be classified as waste some time in the future (CoRWM 2006a, p.189).

Other novel features of the CoRWM process were (CoRWM 2006a pp. 187-192):

- the terms of reference gave equal weight to the objective ‘to inspire public confidence’ and to ‘protect people and the environment’. The Committee was also enjoined to undertake wide-ranging public engagement. In other words the scientific domain (protection of people and the environment) was not privileged over the ‘legitimacy’ domain (inspiring public confidence)
- CoRWM was asked to start *without* pre-conceptions about the best technological route for long-term radioactive waste. This became known as the ‘blank sheet of paper’ approach and was criticised by some members of the scientific community
- the composition of the Committee was unusual. It was not a scientific expert committee, although it contained some scientists. Instead CoRWM members were appointed from diverse backgrounds, including a founder member of Greenpeace UK, a lifelong scientific employee of the nuclear industry, the Chair of the Equal Opportunities Commission, and a citizen member of

the 1999 consensus conference mentioned above. It also included representatives of the academic social science community. CoRWM was to act as a customer for scientific advice but also as a customer for (and generator of) other kinds of knowledge too, including knowledge about the informed views of citizens and stakeholders.

The establishment of CoRWM represented a radical break from earlier policy stances. A visibly independent committee, consisting of members drawn from a range of communities (mostly outside the nuclear industry) had now been charged with responsibility for developing policy across the board for all radioactive wastes – now also including materials such as spent fuel and plutonium that had previously not officially been regarded as wastes. While formal, technical regulation remained in the hands of the same agencies as before, this development had the potential to satisfy the main elements of all three indicators outlined above – segregation of industrial and oversight functions, autonomy of the overseer, and diverse and wide-ranging deliberation. The question is how far CoRWM and the wider policy system in practice fulfilled this promise.

In balancing its twin objectives of achieving scientific credibility and public confidence, CoRWM decided early on that while good science mattered, the critical missing ingredient from previous policy had been public confidence – an essential ingredient of legitimacy. It therefore put most of its early effort into establishing an open dialogue with both the public (i.e. those without prior alignments) and stakeholders. CoRWM set up an internal working group to pursue ‘Public and Stakeholder Engagement’ (PSE) and one of its earliest acts was to set up a first round of this engagement (CoRWM 2006a, pp. 50-65). This was designed to elicit views on a range of subjects including the scope of the inventory to be considered and the criteria that should be used to assess the various management options available. More generally CoRWM wanted to undertake significant ‘upstream’ engagement and develop a broad consensus as to its own process. CoRWM effectively extended the idea of the ‘blank sheet of paper’ that was supposed to apply to management options to its own process – framing the process of deliberation as well as the policy problem was seen as a vital stage in the development of legitimacy.

Much of CoRWM’s work in the first year or so of its existence was devoted to deciding on a detailed programme of PSE. It took advice from the academic community and from specialists in engagement, and learned lessons from previous and largely unsuccessful attempts at engagement on the part of earlier Government initiatives, notably the *GM Nation?* Debate (AECB 2003). In particular it developed

the view that engagement must be as deliberative as possible. The programme it did develop was much influenced by the ideas of Ortwin Renn, in particular his notion of ‘co-operative discourse’ (Renn 2004) where the inputs of experts, public and stakeholders could be combined and synthesised.

Over the two and a half years of its main work, CoRWM held four distinct rounds of PSE activity, in each round turning to the same groups of people it had involved in earlier rounds, as well as adding activities at later stages of its work. The Committee used a wide range of broadly deliberative approaches, including Citizens Panels, discussion groups, a national stakeholder forum, nuclear site stakeholder round tables, a web-based programme and a large school project (CoRWM 2006a, p.2). One external review commented that the CoRWM PSE programme was the ‘...the most elaborate and extensive to have been carried out in this kind of policy issue’ and that CoRWM had ‘...attempted to adopt a highly reflective approach to its task, scrutinising its own assumptions to an extent that contrasts markedly with the technocratic approach taken in the past’ (Simmons and Bickerstaff 2006). Listening was an integral part of the process.

This intense involvement with public and stakeholder engagement, especially during the first year of CoRWM’s life, meant that less attention was paid to conventional scientific scrutiny of options. In its first year, CoRWM did develop a ‘long list’ of 15 management options for HLW and ILW, including widely-approved options like geological disposal and more exotic notions like disposal in space or in subduction zones. But in screening out less plausible options, CoRWM used very limited scientific input. There were two main reasons for this: CoRWM had neither the time nor the money to commission extensive scientific reviews of 15 options; and many options could be screened out on non-scientific criteria alone. For example sub-seabed disposal, while technically attractive, was ruled out after advice from environmental lawyers suggested that there was no hope of amendment to international treaties currently banning such an option (CoRWM 2006a, 80-88).

This early concentration on PSE at the apparent expense of ‘sound science’ created much political controversy. Both the Royal Society and the House of Lords Science and Technology Committee criticised CoRWM in quite severe terms for its apparent pandering to public and stakeholder opinion at the expense of a rigorous scientific evaluation of the options. The Lords, for example, doubted whether CoRWM could evaluate scientific evidence critically (House of Lords 2004, 15). It also regarded CoRWM plenary meetings (all of which were open to the public to attend as part of a far-reaching transparency

policy) as a ‘satire on bureaucratic processes in general’ (House of Lords 2004, 15). There was also internal dissent, with two members of CoRWM (both of whom eventually left the Committee) expressing even more radical doubts as to the competence and even the *bona fides* of the Committee’s activity (Ball 2006). These members accused the Committee of pursuing a dangerous post-modern and relativist view of the world (and of science in particular) but their views were unjustified and effectively countered, not least by the Committee’s own actions.

This early turbulence in the Committee’s work clearly illustrates the apparent dichotomy between the pre-2000 expert-led science-based process of decision-making and the new attempt to involve deeply both public and stakeholders in the process of reaching decisions: the change from ‘factual validity’ based on expert judgement alone to a view of factual validity constructed through wide-ranging deliberation between lay and expert communities. The dichotomy would only be real if there was evidence that deliberation produced consensus for scientifically ‘unsound’ options. The evidence from the CoRWM process was that deliberative engagement produced the result that the public and stakeholders took it as given that the best possible science would be deployed as appropriate. The problem was rather that, hitherto, decisions had been taken in a secretive, unaccountable way, with public opposition to each round of proposals being treated as ‘irrational’. ‘Sound science’ was a necessary but not sufficient condition for good decision-making: the difficult and previously poorly-explored dimension of good decision-making was the creation of trust and consent through open and transparent procedures in autonomous fora.

CoRWM did employ much scientific expertise (including ‘counter expertise’) after it had narrowed its long list of options down to a short list of four (CoRWM 2006a, 66-74). But even here its work consisted of a review of *existing* scientific evidence, not the commissioning of new work. CoRWM also aimed to confine expertise to where it was essential and legitimate. The Committee’s decision process included a formal multi-criteria analysis (MCA) as well as a ‘holistic’ assessment which drew on explicitly ethical considerations, especially inter-generational equity. The CoRWM MCA, like most others, consisted of three distinct stages: development of criteria; assessment of option performance against criteria; and weighting of criteria. CoRWM used its PSE engagement programme to develop both the criteria *and* the weighting. Only the middle, performance-assessment stage, was allocated to experts. CoRWM therefore attempted, even in its most technical activities, to maximise the deliberative input from public and stakeholders (CoRWM 2006a, 89-110). In developing its views CoRWM effectively integrated four

streams of knowledge derived from; public and stakeholder engagement; ethics; the MCA; and overseas experience.

CoRWM made its main recommendations to Government in July 2006 (CoRWM 2006a). These were not a surprise, either to Government or others. This was partly because the Committee had always operated transparently (not only meeting in public but also placing all documents on its web-site) and partly because its draft recommendations were published in April 2006. A fourth PSE round in May and June 2006 did not substantively affect its recommendations. The Committee had been required in its terms of reference to recommend the best option (or option combination) and was also given the choice of reporting to Government on implementation. The distinction between the best option and its implementation always seemed a false distinction to the Committee - CoRWM regarded implementation as integral to the whole process. The same technical option might stand or fall politically depending on different approaches to implementation. CoRWM therefore not only framed its 'option' recommendations in terms of implementation issues, it also produced a second major report (also in July 2006: CoRWM 2006b)) specifically exploring critical implementation issues in more detail.

Within the overall package of recommendations in July 2006, three 'pillars' stand out (CoRWM 2006a, 3):

- geological disposal as the right end-point for all legacy HLW and ILW
- robust interim storage, possibly for 100 years or more, as an integral part of policy (as well as acting as a fallback should disposal fail)
- for siting of major new facilities, a voluntarism and partnership approach between Government/industry and affected local communities, critically allowing local communities to withdraw from negotiations up to a pre-determined point if they were not satisfied with the terms being offered.

In terms of substance, it was the third 'pillar' (implementation) that was new: storage was the default option and the scientific community and industry had mostly favoured geological disposal for two decades or more. Voluntarism and partnership -while familiar ideas for radioactive waste management in Belgium, Finland and Sweden - were novel in the UK and provided a potentially vital safeguard for the interests of potential host communities.

But CoRWM's process was vital too. The Committee had reached a recommendation in favour of disposal only after an open and deliberative process, in which opposing views had been heard and respected. While CoRWM was never going to be a simple conduit for the views of the public and stakeholders, it was the case that the great majority of both groups were supportive of CoRWM's recommendations (virtually unanimously in the case of the four Citizens' Panels). By mid-2006 the views of the House of Lords and other earlier critics had changed radically: they too supported the Committee's recommendations (House of Lords 2007). This gave a quite different and much more broadly-accepted (and therefore legitimate) meaning to the disposal recommendation than had been the case hitherto. Even those groups (for example Greenpeace) who remained strongly opposed to geological disposal gave public support to the CoRWM process (Greenpeace 2006)

Government welcomed the CoRWM recommendations and in a statement in October 2006 accepted all its main recommendations, including the ideas of voluntarism and partnership (Defra 2006). Nirex was wound up and the NDA (a public sector body), through a new division, was given responsibility for the long-term management of all UK radioactive wastes. NDA therefore now has executive responsibility for all 'back end' activities, from initial decommissioning to final disposal of wastes. A new committee, retaining the name of CoRWM, but with new membership and new terms of reference, would in future provide advice to Government on implementation of the new strategy. It initiated a new round of official consultation which ended with a Government policy statement in June 2008 (Defra/BERR 2008).

Re-linking radioactive waste management with nuclear development (2007/8)

There is however one major complication, which potentially threatens the ability of Government to pursue the new policy effectively. This was the re-emergence of the issue of nuclear new build. When CoRWM started work in November 2003 new nuclear power stations appeared to be off the political agenda for the indefinite future. An energy White Paper earlier that year had been scarcely lukewarm about nuclear power and explicitly stated that Government was not recommending new nuclear development. This meant that in its early work, CoRWM could concentrate almost exclusively on the issue of legacy waste. This was politically relatively uncontroversial – all parties recognised that a 'least worst' solution had to be found for radioactive material which had to be managed as a result of past decisions. But in late 2005 the political climate around nuclear power changed rapidly and it became clear that Government had rediscovered an enthusiasm for nuclear new build. This immediately re-established the link between waste and new build which had previously been absent in the CoRWM

process, and led some stakeholders (those opposed to new build) to become less co-operative in the process of finding ways forward for waste management.

CoRWM's response was to draw a clear distinction between the issues of legacy waste and new build waste. It was clear that *technically* there was no distinction between the management of legacy waste and new build waste. Both could be accommodated in the same stores and disposal sites. But CoRWM repeatedly made its view clear that the political, social and ethical issues surrounding the deliberate creation of new wastes were quite different from those arising from the inevitable need to manage the legacy (CoRWM 2007). Creating new build wastes was a choice, and there were alternatives. So if, for example, the inter-generational problems arising from creating new wastes were considered unacceptably high relative to other options, such as developing renewable energy, it would be quite possible to argue in favour of disposal of legacy waste and the avoidance of creating new wastes. It would equally be possible to argue the opposite case. The point was that such an argument had not been considered by CoRWM and needed a separate public debate. CoRWM therefore argued that it had no view on the desirability or otherwise of new build, but that the waste implications of any new build proposals would need their own assessment process, additional to that of CoRWM.

Some parts of Government chose to ignore this message. In particular the DTI, later re-named DBERR, or Department for Business, Enterprise and Regulatory Reform, presented CoRWM's views in 2006 purely in terms of its endorsement of the technical similarity of legacy and new build waste management solutions (DTI 2006). Greenpeace instigated a judicial review of government's consultation process on the subject of nuclear power and a High Court judge found in its favour. One of the two grounds on which the Government's consultation was ruled illegal was in its treatment of the radioactive waste issue, where Mr Justice Sullivan found that Government's presentation had been 'seriously misleading' (Sullivan 2007), precisely on the issue of legacy versus new build waste. One result of this judgement was that Government had to undertake a further consultation on nuclear power before finally announcing a new, pro-nuclear stance in January 2008. But the habit of conflation has persisted and in the June 2008 policy statement on radioactive waste management (Defra/BERR 2008), Government draws no distinction between legacy and new build wastes.

Enthusiastic UK Government support for nuclear new build was always likely to make the pursuit of enduring waste management solutions more difficult, as opponents of new build were likely to use

waste as a campaigning issue. But by conflating the issues of legacy and new build waste Government has probably made the implementation of CoRWM's legacy waste proposals less straightforward than if it had clearly separated the two issues. CoRWM's success in starting to 'inspire public confidence' had raised the prospect that a broadly legitimate process of implementing a management strategy for ILW/HLW could start; but the 'infection' effect of Government's conflation of legacy and new build waste issues will almost certainly make implementation of the CoRWM legacy waste proposals more difficult. The problem may be made more difficult because the new CoRWM, now re-constituted as a conventional expert committee, has a quite restricted mandate (Defra 2006, Annex A). Implementation of policy now lies with the NDA, a Government-owned body which has not yet achieved high levels of public trust. The 'regulatory/oversight' function has now therefore passed to a body much closer to Government and less independent than CoRWM, while the 'oversight' role has diminished as the House of Lords Science and Technology Committee has argued forcefully (House of Lords 2007).

Conclusions

The long and tortuous story of UK radioactive waste policy demonstrates one thing clearly: that achieving legitimacy around the management of these wastes is a social process with time horizons that resemble the decay constants of long-lived ionising radiation. After 50 years of policies, institutional change and debate, extraordinarily little has been achieved in securing the long-term disposition of wastes. This is in large part, as we have argued in this paper, because a failure to generate legitimacy around proposals. Our key arguments are that first, at least until the period of CoRWM, the fundamental conditions for open and reasoned discourse about the options did not exist, and second, the commitment of Government to establishing stable conditions for legitimacy (principally, a segregation of industrial objectives in new build from environmental and safety objectives in pursuing waste management) has been inconsistent. Since industrial objectives have for most of the post-war period had primacy, it has frequently been expedient for Government to break the chain of legitimacy and abandon efforts to implement waste management and disposal programmes. Generating legitimacy can be a slow business, especially if gaining legitimacy in a peripheral domain of policy risks undermining legitimacy in a core domain.

In this paper we developed three indicators that connect institutional change with the generation of legitimacy: institutional segregation between operators and overseers; the autonomy of regulatory and oversight bodies; and the diversity of oversight bodies. Seen over the long history of institutional

changes we have described, we can recognise a very uneven development towards greater segregation between operators and overseers. While nuclear safety and radiological protection regulation has been carried out since the early 1960s by segregated, and to a high degree autonomous, Government agencies, ownership of the complex of UK nuclear facilities has been highly dynamic, alternating since the late 1980s between public and private ownership. Executive responsibility for radioactive waste management has fluctuated in a similar way, with quite a long period between 1981 and 2004 in which the nuclear industry (in both public and private ownership) was given responsibility for developing waste disposal options. The fundamental problem with this construction was that this 'arms-length' relationship was only apparent – in successive decisions, beginning in 1987, Government repeatedly rejected Nirex proposals. CoRWM between 2003 and 2006 marked the period when the oversight role was most clearly segregated from nuclear operations, although there may have been a narrowing again subsequently. In sum, there is no neat linear history to be told on the question of segregation.

On the second indicator – autonomy of oversight and advisory bodies – it is easier to see a progression from closed committees and agencies with relatively limited autonomy from political control, towards bodies which were increasingly more independent, and either given stronger powers of enforcement (the NII and the EA, for example), or given more authority, requiring Government to respond to advice (the comparison between the terms of reference of RWMAC and of CoRWM is a clear example here). An important factor here was the implementation of changes in UK public administration as a whole as a result of the 'new public management' (Hood 1991; Osborne and Gaebler 1992). In this case therefore, external factors were critical in creating new conditions for the generation of legitimacy.

The third indicator – the diversity of oversight and advisory bodies – appears also to be demonstrated over the history of UK radioactive waste policy. Here the main evidence also relates to the composition of oversight bodies like RWMAC and CoRWM, and in the increased role that actors outside the nuclear community began to play in the formulation of radioactive waste policy, especially after 1997.⁸ While the Royal Commission on Environmental Pollution (RCEP), an august scientific committee made up of experts from a wide range of disciplinary backgrounds, had an important role as early as 1976 in reshaping UK radioactive waste policy, it was only in the 1990s that the opinions of House of Lords committees really began to make a marked impression on the content of policy.

⁸ Again, this is at least partly explained by broader administrative changes relating to public appointments in the UK (McTavish and Pyper 2007).

But the final conclusion to be drawn is that the ability to listen and to create new conditions for the construction of legitimacy by demonstrating open and reasoned discourse about factual and normative claims that appeared to have been secured under CoRWM may again be under threat. While satisfaction of the three indicators suggested in this paper may be a necessary condition for developing sustainable radioactive waste management policy, it may not be sufficient, especially where external factors change unfavourably (the renewed political commitment to building nuclear reactors) and institutional structure changes again (the NDA and the new 'Mark 2' CoRWM) in ways that may make it harder to sustain the conditions for legitimacy. Givenness is hard to create, but easy to destroy: the UK Government's new enthusiasm for a rapid and 'streamlined' (read 'more closed' and less deliberative) decision process for building new reactors creates the risk that the new created conditions for legitimacy will now be undermined.

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